Condition 24	Liquefaction

Prior to completion of the improvement plans for the proposed project, a geotechnical report that addresses liquefaction hazards shall be prepared and approved by the Planning Director. The geotechnical report shall state the recommended actions for the collection system, effluent disposal system, treatment plant site, and all appurtenant facilities so that potential impacts from seismically-induced liquefaction would be reduced to less than significant. These recommendations shall be incorporated into the design of all proposed facilities that are part of the collection system and at the treatment plant site.

Evidence of compliance:

The potential for Liquefaction at the project site was evaluated by Fugro West, Inc., and the findings indicate that the site soils are generally not considered prone to liquefaction or seismic settlement (see Attachment 1) because the soils are either cohesive clay soils or are dense and not considered vulnerable to liquefaction.

The report concludes that the site is located within a seismically active area and should be designed to current code standards and practices. The soils encountered at the site are not considered vulnerable to liquefaction, seismic settlement, or strength loss in response to the design earthquake and no special geotechnical recommendation to mitigate those hazards are needed for design (see Attachment 2).

Condition Satisfied–Treatment Facility

Director, SLO County Planning

6/25/2013

Date

Attachment 1

magnitude M7.0 earthquake occurring on the Los Osos Fault. The deterministic spectrum was calculated using the same equally-weighted averages of attenuation relationships mentioned above and Abrahamson and Silva (2008). In accordance with ASCE (2005) and CBC 2010, 150 percent of the deterministic spectrum was compared to a deterministic lower limit, and the greater spectral accelerations are included in the deterministic MCE spectrum.

Site-Specific Design Response Spectra. The site-specific design response spectrum corresponds to 2/3 of the estimated MCE spectrum in accordance with the CBC 2010 (Chapter 21 of ASCE 7-05). The spectra on Plate 7b were scaled using the procedure recommended by Abrahamson et al. (2003). Empirical attenuation relationships allow for the estimation of response spectral ordinates for periods up to 10 seconds. For tank design, spectral ordinates have been extrapolated to higher sloshing periods of up to 15 seconds. The spectral values beyond a 10 second period were extrapolated assuming constant spectral displacement. The site-specific MCE design response spectrum described in this report takes into account the variation of near-surface stratigraphy at the project site. Therefore, the spectrum is applicable directly at the foundation level.

4.2 LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction is a loss of soil strength due to a rapid increase in pore water pressures due to cyclic loading during a seismic event. Procedures used to evaluate liquefaction hazards are described in the 1997 NCEER guidelines (Youd and Idriss, 2001). Liquefaction commonly occurs in loose to medium dense sandy soil that is below the groundwater table at the time of an earthquake. The potential and severity of liquefaction will depend on the intensity and duration of the strong ground motion. Seismically induced settlement can occur in association with liquefaction and in soils not prone to liquefaction which are loose or medium dense and weakly cemented. Settlement, lateral spread, collapse, and loss of bearing support are common manifestations of liquefaction. Predominant geologic units at the site are stiff to hard clay (Qal_1 and Qal_2) and dense to very dense sand (Qal_3). Occasional blow counts suggesting medium dense soils were encountered at various depths below the groundwater table, but the blow counts were discounted for liquefaction analyses and occurred when the borehole hole "sanded in" because of disturbance caused by the auguring. The site soils are generally not considered prone to liquefaction or seismic settlement because the soils are either cohesive clay soils or are dense and not considered vulnerable to liquefaction.

4.3 SLOPE STABILITY

Slope stability analyses were performed as a basis for providing recommendations for Segmental Masonry Unit (SMU) walls using the computer program SLIDE (Rocscience 2010). SMU walls are proposed along the exterior slopes of the recycled water storage ponds and along the northeastern slope of the plant. The walls were modeled for retaining wall heights ranging from a maximum 5.5 feet to 18 feet to estimate the minimum spacing, strength and embedment of geosynthetic reinforcements that would be needed to provide a stable wall configuration for various wall heights. The face of the walls were assumed to be interlocking masonry blocks at a batter of approximately 1h:6v.

Attachment 2

control sample swelled by approximately 10 percent when flooded with water, while the lime treated specimen swelled by approximately 1.5 percent. The lime treated soil was therefore *not* considered suitable for use as non-expansive backfill behind retaining walls or buried structures. However, the limited use of lime during construction could be used by the contractor to assist in reducing the moisture content of clay fill or subgrade soils. The use of lime by the contractor would only be to assist with compaction or stabilizing the subgrade, if necessary, and based on the soil moisture and weather conditions at the time of construction.

- Groundwater was generally encountered below el. 50 feet, at depths ranging from approximately 22 to 46 below the ground surface. The anticipated depths of excavation are generally above the groundwater levels encountered in our explorations and should not require dewatering.

- The site is located within a seismically active area and should be designed to current code standards and practices. The soils encountered at the site are not considered vulnerable to liquefaction, seismic settlement, or strength loss in response to the design earthquake and no special geotechnical recommendations to mitigate those hazards are needed for design.

- The proposed buildings and above grade structures can be supported on spread footings or mat foundations. The design of foundations, slabs and pavements will need to consider potentially expansive subgrade conditions.

- The ponds will likely also be excavated in clay, and may encounter dense silty sand below the clay in some areas. The ponds will be bottomed above the groundwater table, and the slope can be lined and designed using slope inclinations of 2h:1v or flatter as planned.

- The onsite soils can likely be excavated with typical heavy construction equipment. Excavations should be properly dewatered in advance of the excavation, and be sloped or shored per OSHA guidelines. The design of temporary slopes and shoring systems should consider the presence of existing structures and include provisions to protect existing structures that must remain in operation during construction.

5.2 SEISMIC CONSIDERATIONS

5.2.1 Seismic Data

Structures should be designed to resist the lateral forces generated by earthquake shaking in accordance with the building code and accepted design practice. This section presents seismic design parameters for use with the 2010 California Building Code (CBC) and ASCE 7-05. The site coordinates and USGS interactive web page (V3.0.1 last updated 2012-07-12) were used to obtain the seismic design criteria. The average shear wave velocity within the upper 100 feet of the site is estimated to be approximately 310 to 335 meters per second, corresponding to a Site D, Stiff Soil Site. The California Building Code proposes a building occupancy category of "III" for wastewater treatment facilities. The peak ground acceleration